Some remarks on Ocean Currents and Climate

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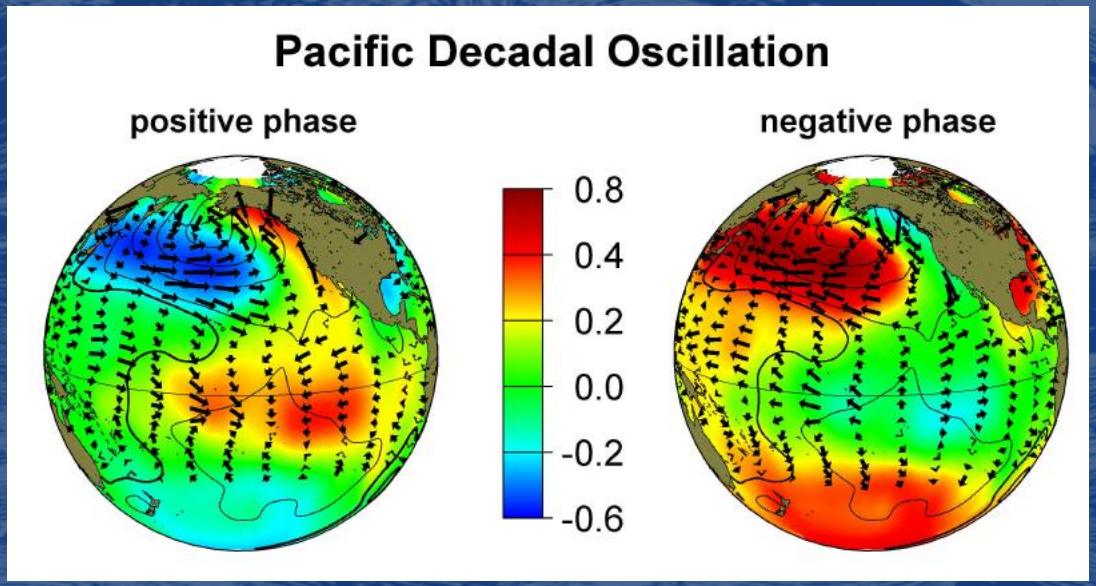
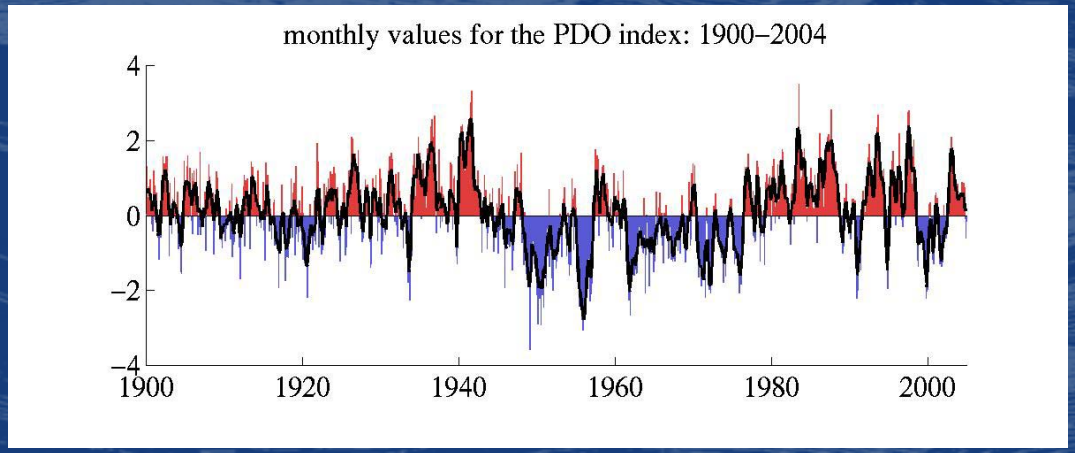
Presented to House Subcommittee on Fisheries & Oceans, 8 June 2005

Pacific Decadal Oscillation

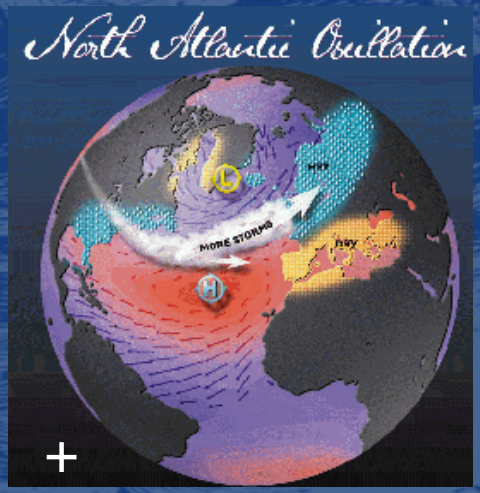
The two phases of the PDO (upper right) with Sea surface temperature, SST (colors) and surface winds (arrows). A 100+ year time series of the PDO (lower right) showing phase changes from positive (red) to negative (blue) states.

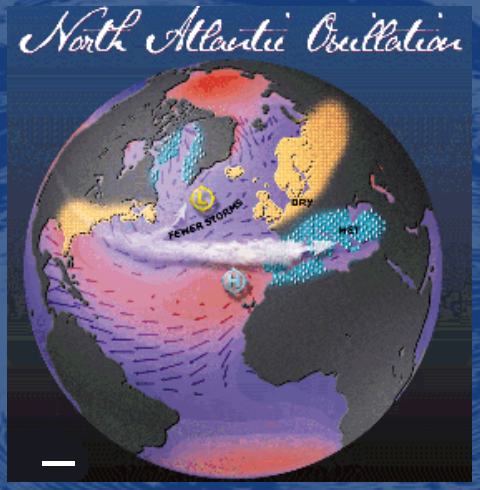


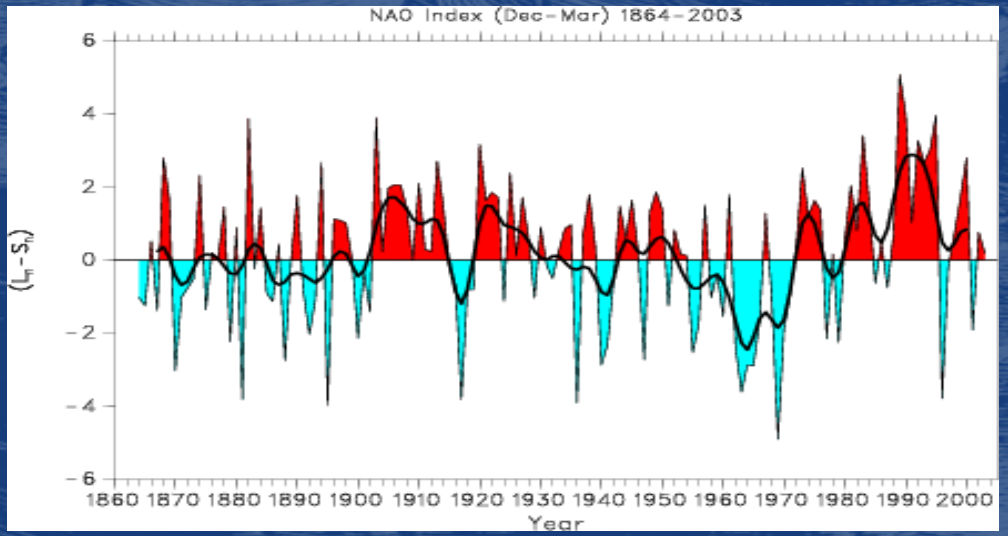


North Atlantic Oscillation

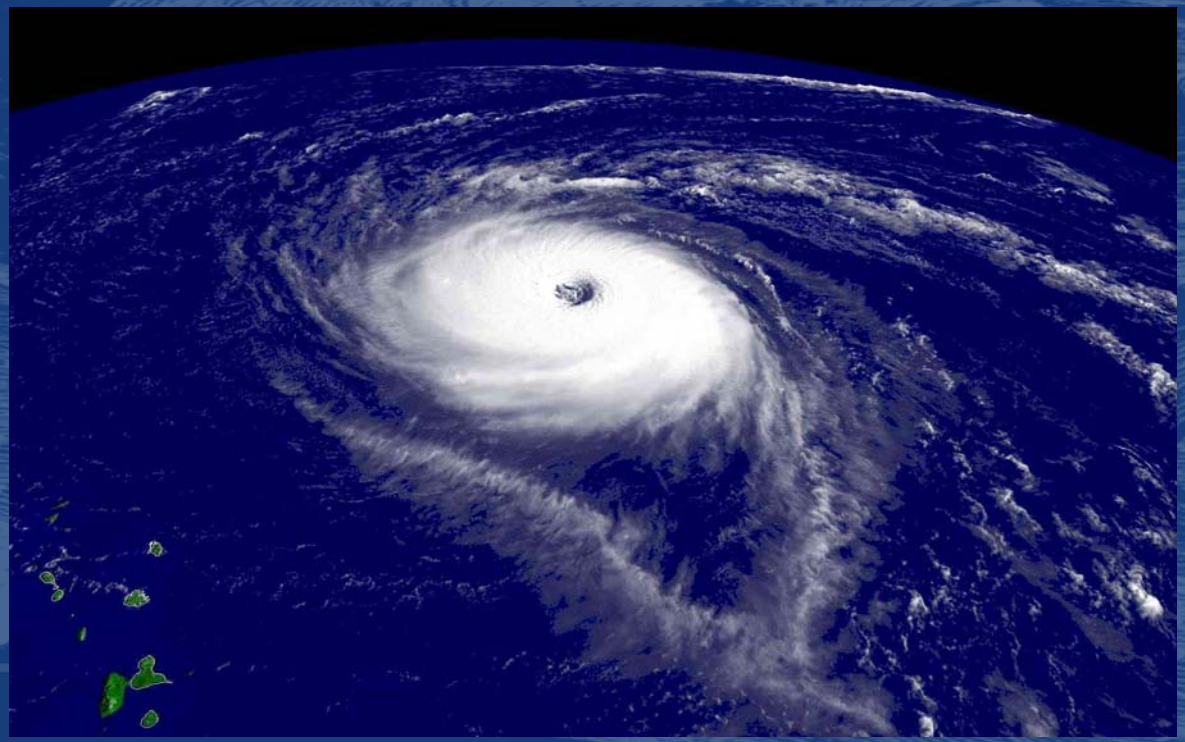
NAO phases are positive (upper left), negative (upper right), depending on the relative strengths of the sea level pressure of the Icelandic Low and the Azores High. Note position of storm track (white clouds). The NAO 140+ year time series (lower panel).





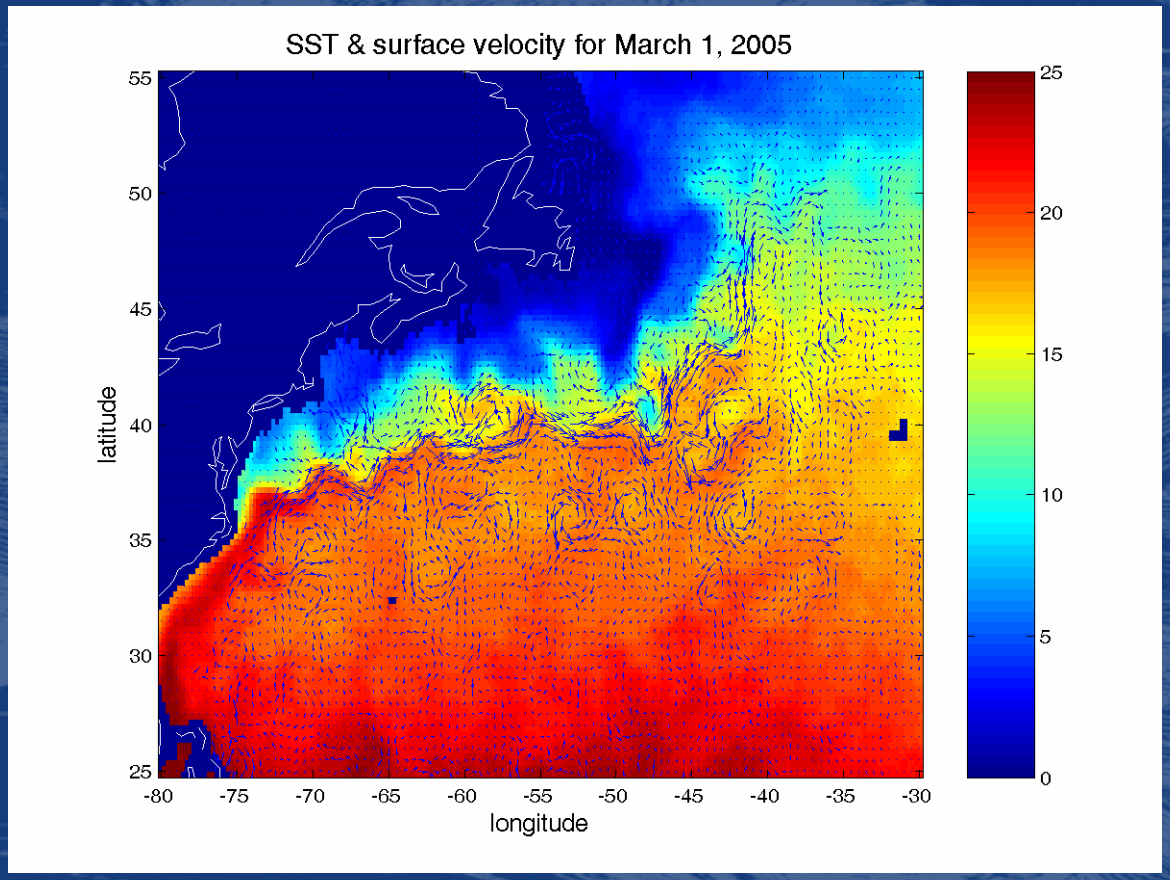


Atlantic Hurricanes and the NAO



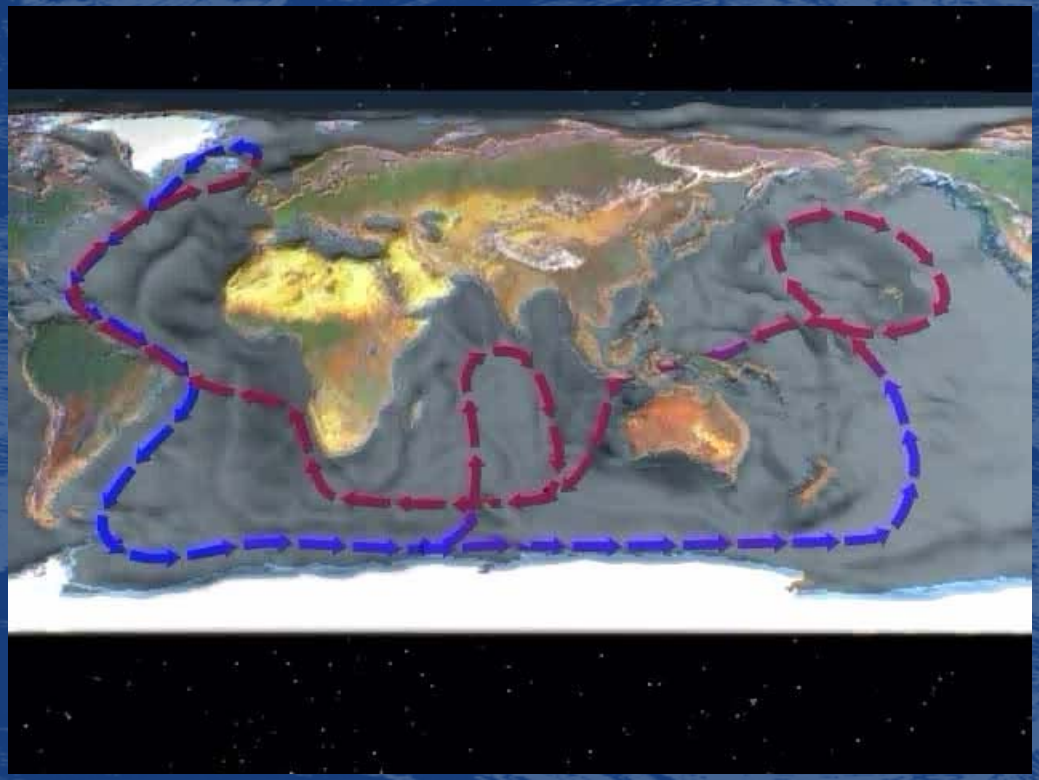
For summers following a winter with negative phase NAO, more intense hurricanes have landfall on the continental US Gulf and SE Coasts. Here Isabel is a category 5 hurricane but reduced its strength before landfall near Chesapeake Bay in Sept. 2003.

The Gulf Stream as a Heat Engine



The Gulf Stream transports more heat towards the Arctic than the Kuroshio in the Pacific. This excess amounts to the equivalent of 1000 times the total electric power generated in the US in 2000. Changes in this transport can affect our climate.

The Great Ocean Conveyor



Warm surface currents (red arrows) carry heat northwards in the Atlantic Ocean, with cold, deep (blue arrows) flows towards the south after surface waters are cooled & sink. This conveyor plays a central role in the earth's climate system, which is expected to be altered by Global Warming.

Summary

With continued federal support, we are working with international partners to

- Build an ocean observing system capable of providing knowledge about the surface and ***subsurface*** properties & currents in the ocean and
- Develop better models capable of making dynamical predictions of both natural and anthropogenic climate change